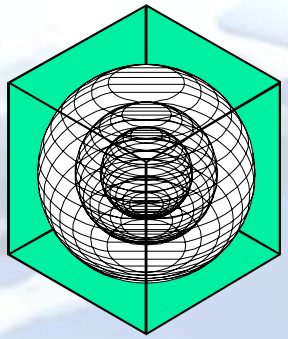
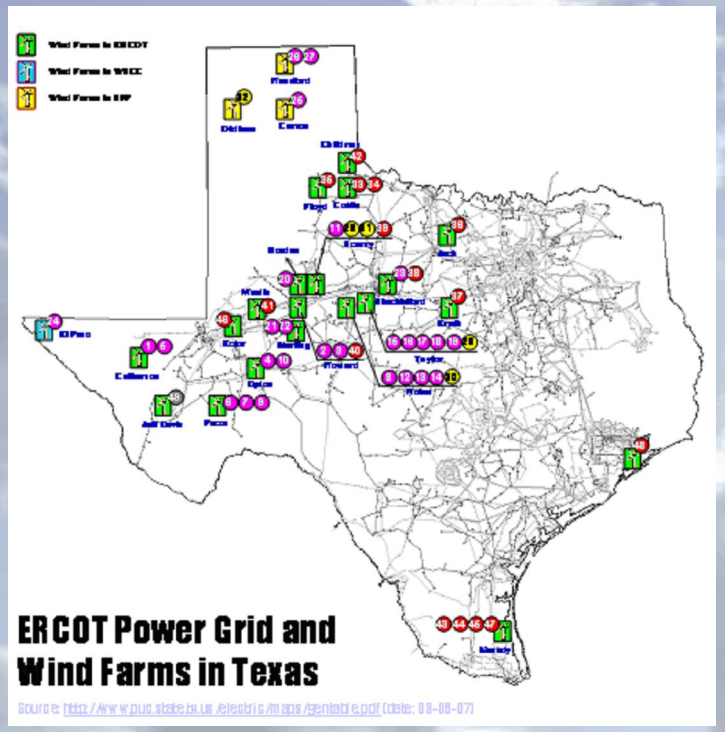
STATEWIDE AIR EMISSIONS CALCULATIONS FROM ENERGY EFFICIENCY, WIND AND RENEWABLES

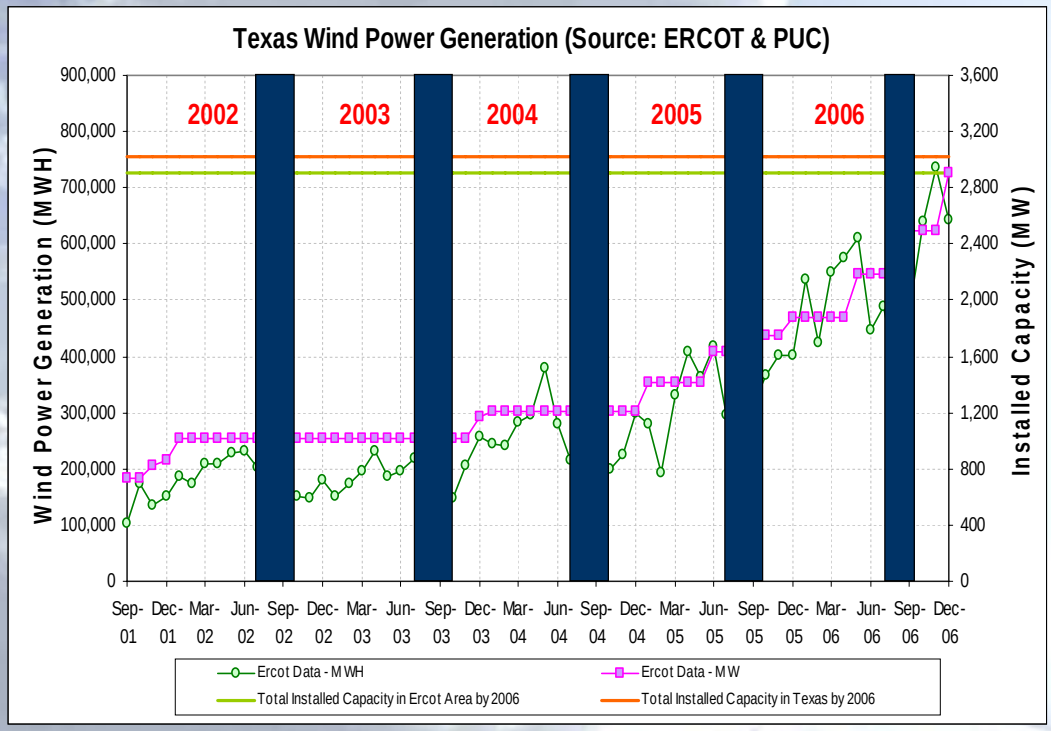
May 2008

Energy Systems Laboratory
Texas Engineering Experiment Station
Texas A&M University System



Electricity Production from Wind Farms (2002-2007)

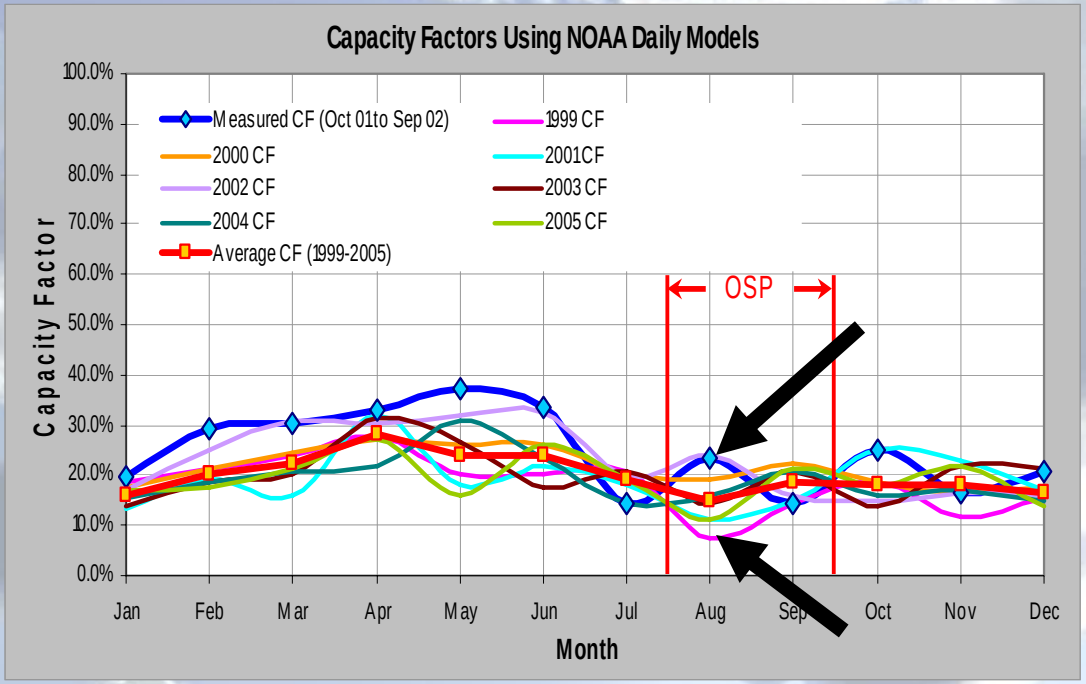




- *Installed capacity of wind turbines was 3,026 MW (March 2007).*
- *Announced new project capacity is 3,125 MW by 2010.*
- *Lowest electricity period occurs during Ozone Season Period.*

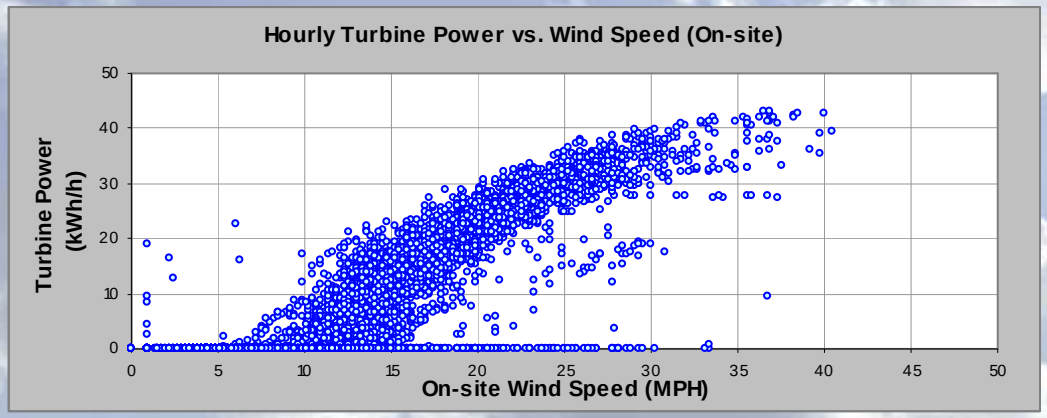
Calculating NOx Reductions from Wind Farms

What issues did TCEQ ask ESL to resolve to calculate OSP NOx reductions from wind farms in the base year?



Large variations in measured power vs base year power production in the OSP.

Calculating NOx Reductions from Wind Farms

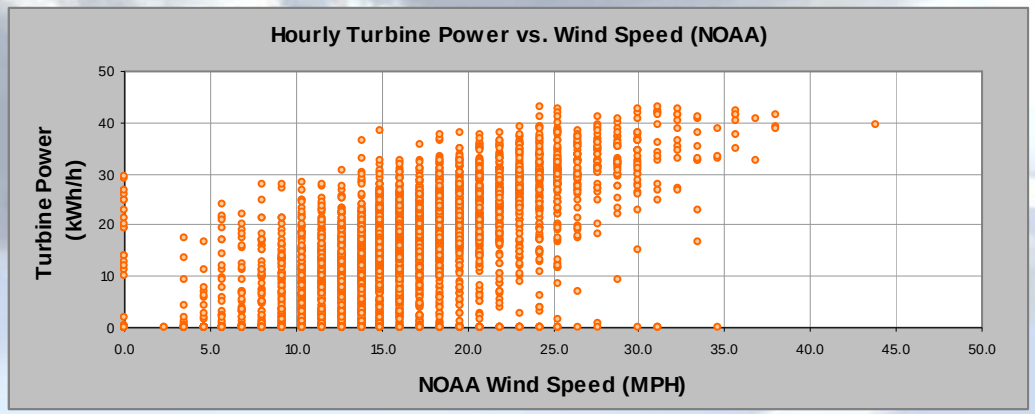


Hourly electricity produced vs on-site wind data acceptable for hourly modeling.

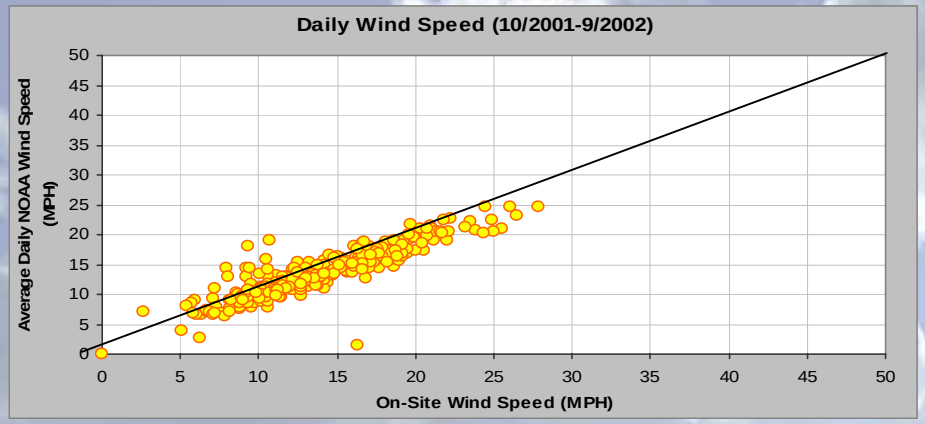
Issue: hourly on-site data not always available.

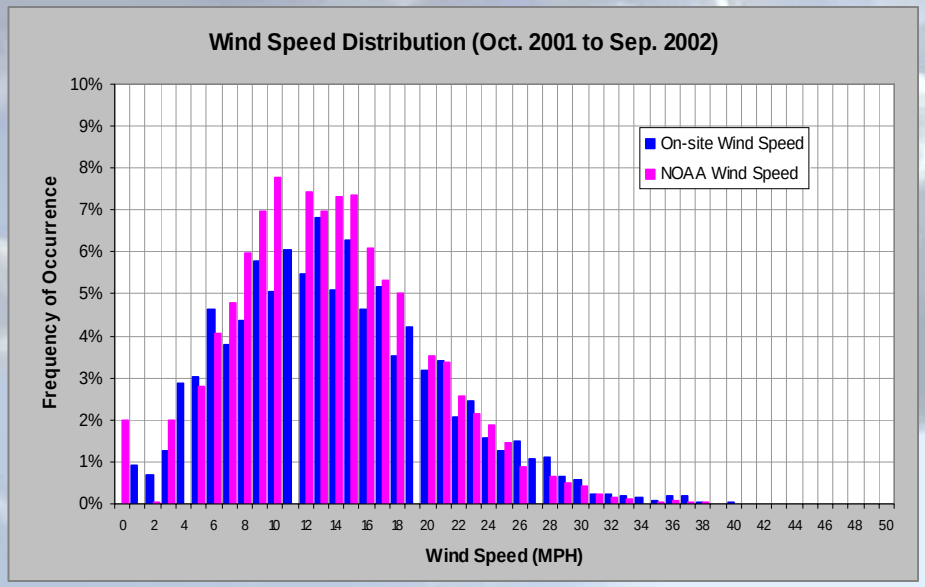
Next, looked at hourly electricity produced vs NOAA wind data.

Issue: too much scatter.



Calculating NOx Reductions from Wind Farms

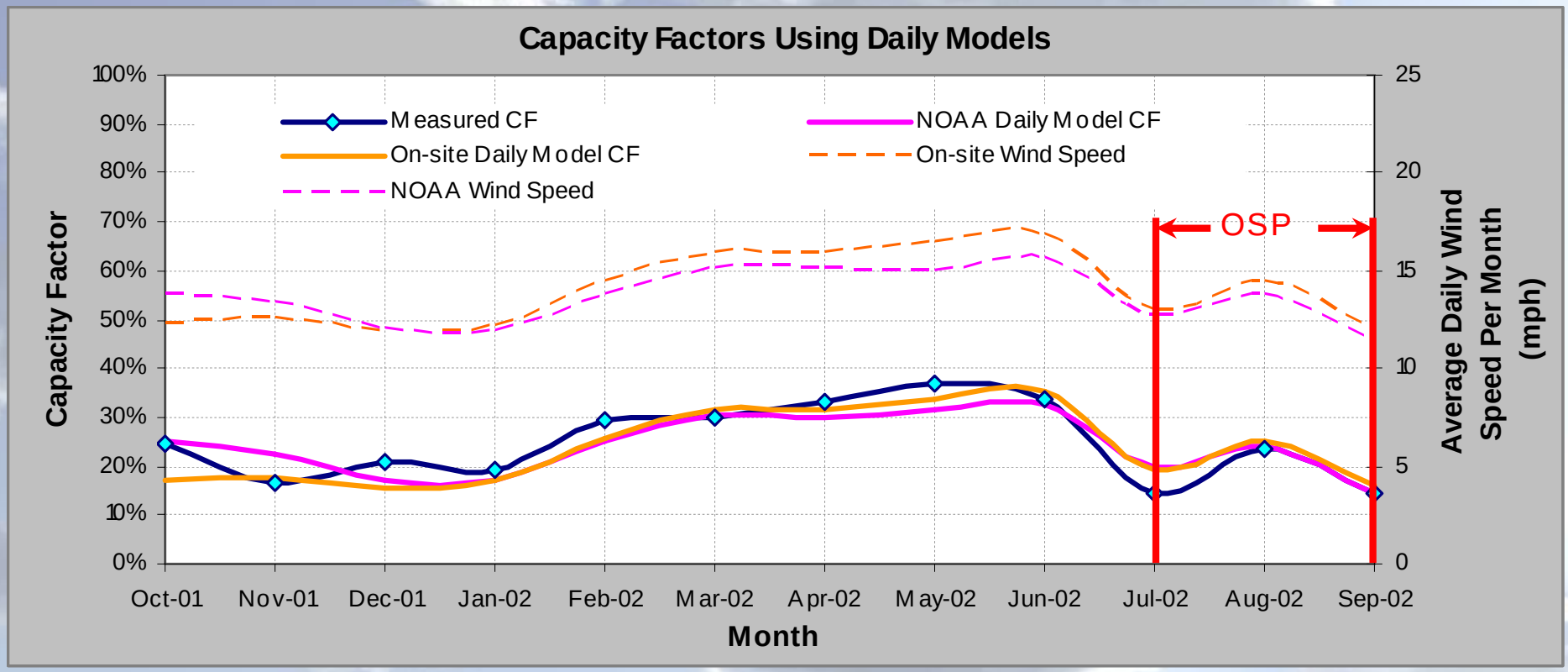




Next, compared daily on-site wind data vs daily NOAA data

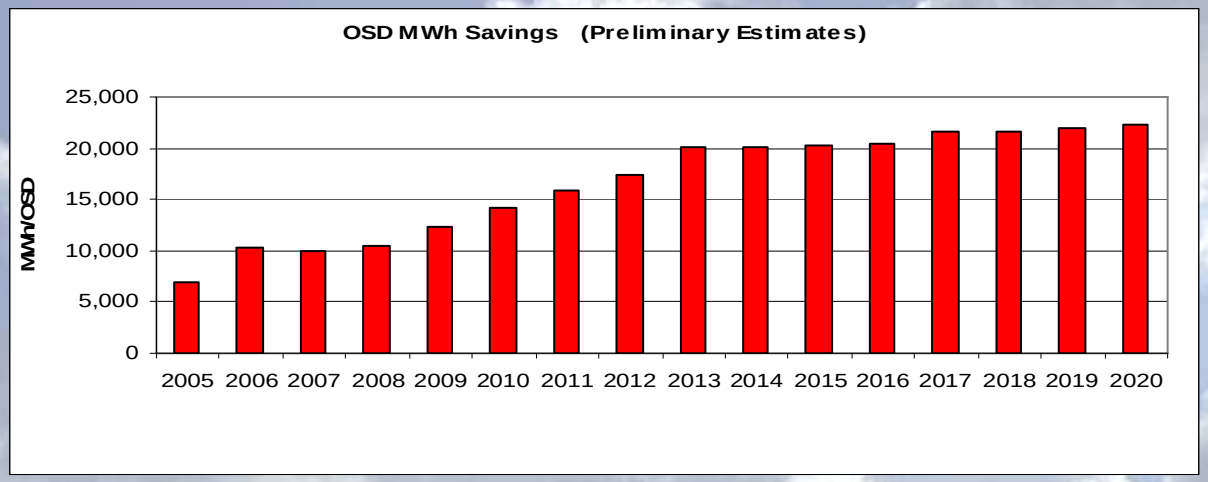
Result: Daily data was acceptable when frequency of occurrence was similar.

Calculating NOx Reductions from Wind Farms



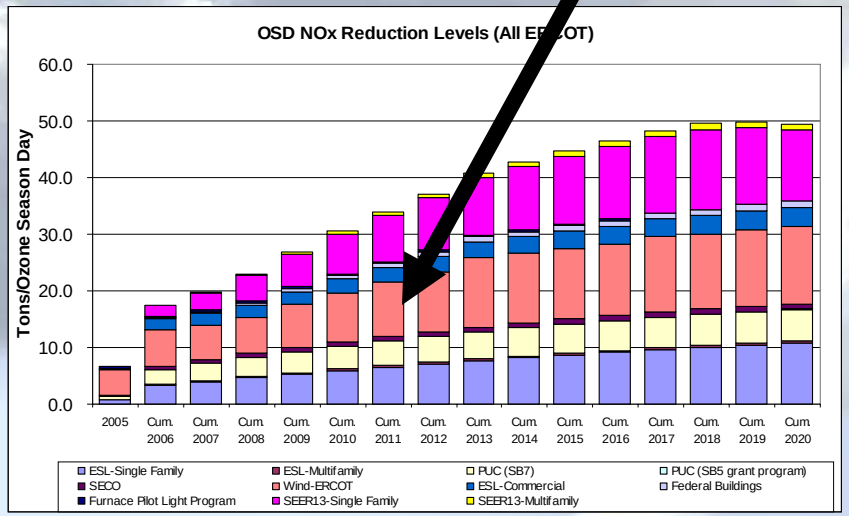
Next, compared NOAA and on-site daily models to see how well the predicted OSP electricity production. (Result: acceptable).

Calculating NOx Reductions from Wind Farms



Energy savings summary: (program wise)

Base year	**1999**
Projection year	**2020**
Adjustment factors	
Annual degradation factor[5]	5.00%
T&D loss	0.00%
Initial discount factor[6]	25.00%
Growth factor	According to SB 20, section 39.904

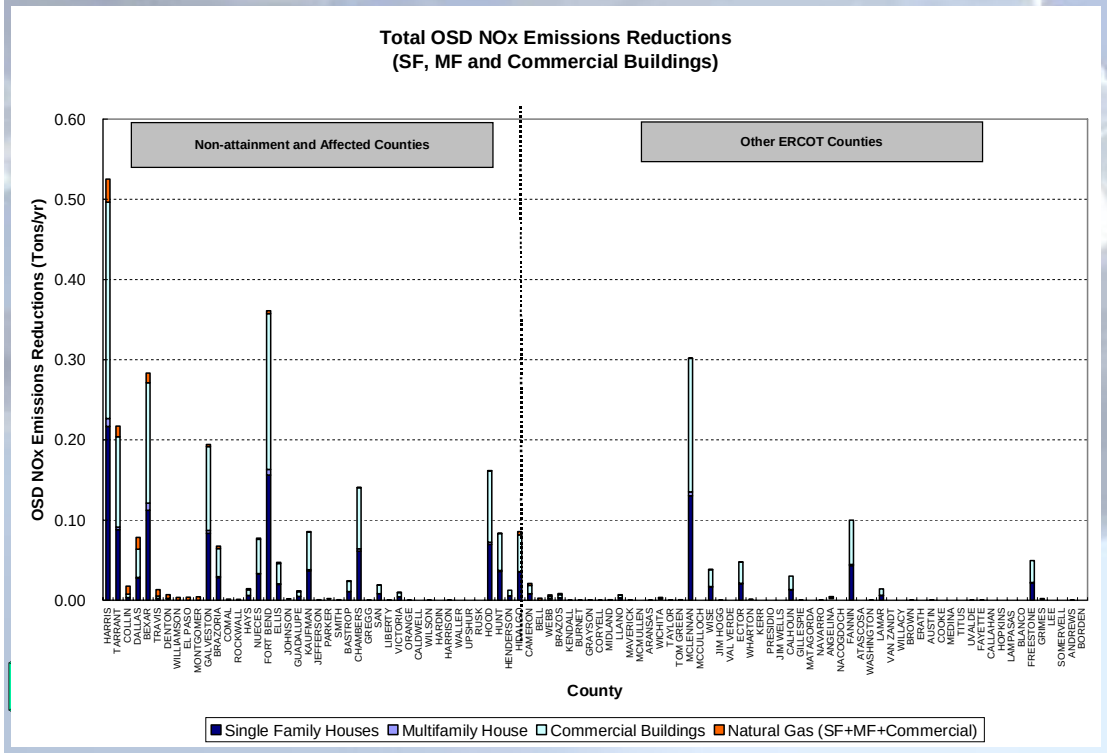


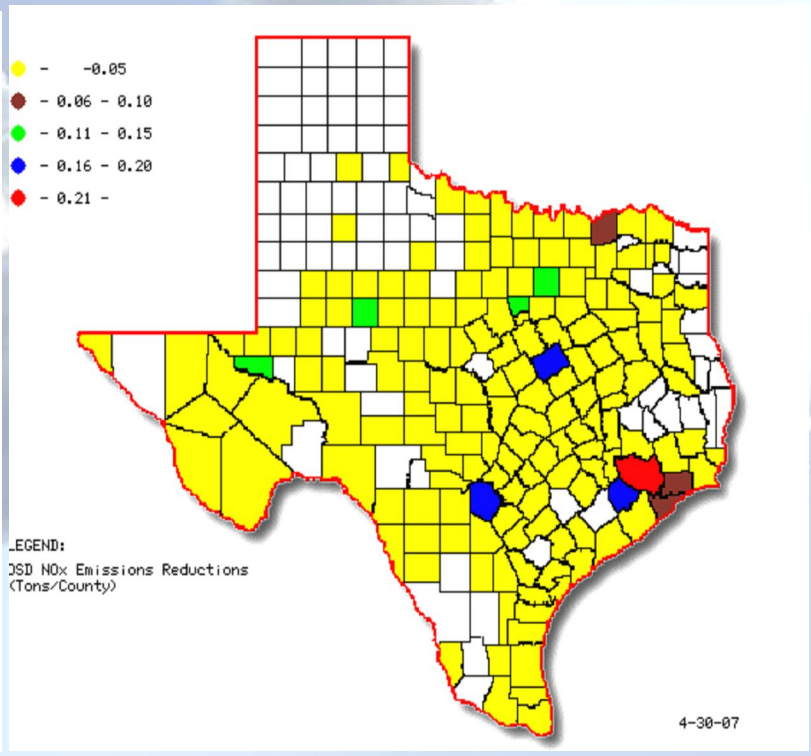
Final Issue: TCEQ asked ESL to develop an integrated tool to project NOx reductions from wind farms through 2020 by county, using eGRID, including:

- *+ discount,*
- *+ degradation,*
- *+ T&D losses &*
- *+ growth.*

Energy Efficiency Reporting

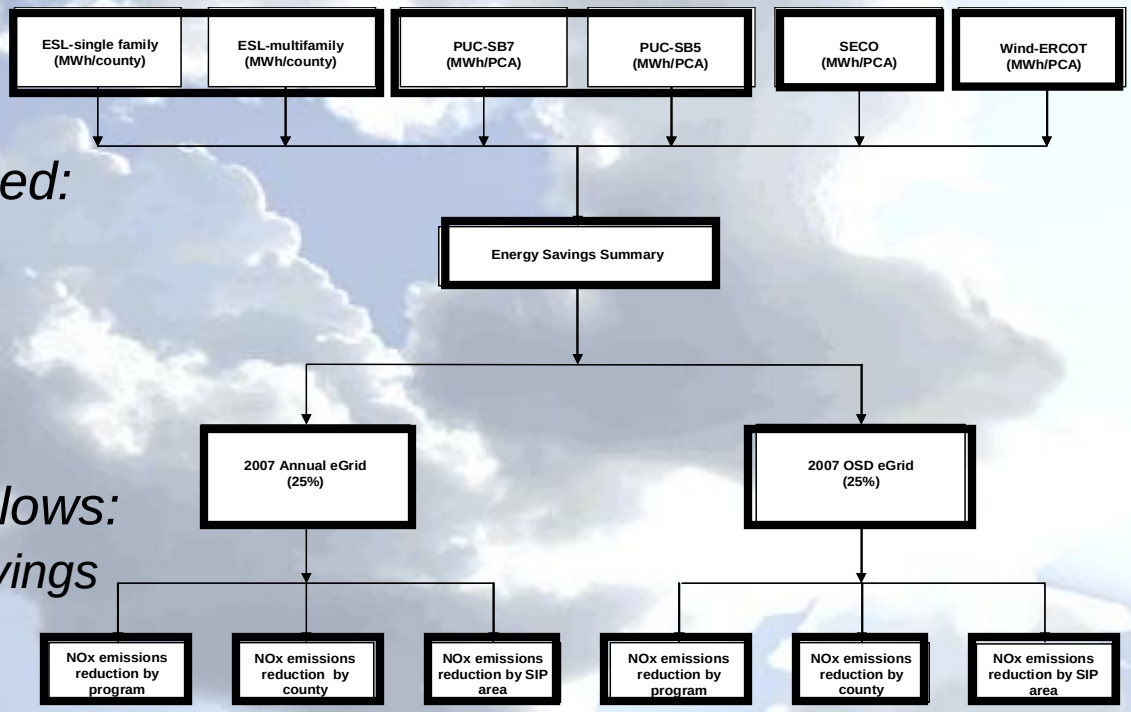
NOx emissions reductions calculated from new residential and commercial construction using EPA's eGRID and AP-42 (Result: 10.75 tons/OSD).





Integrated NOx Savings

In 2005 the TCEQ initiated a program to determine integrated NOx emissions savings (2013 and beyond) to allow for savings to be reported to the EPA



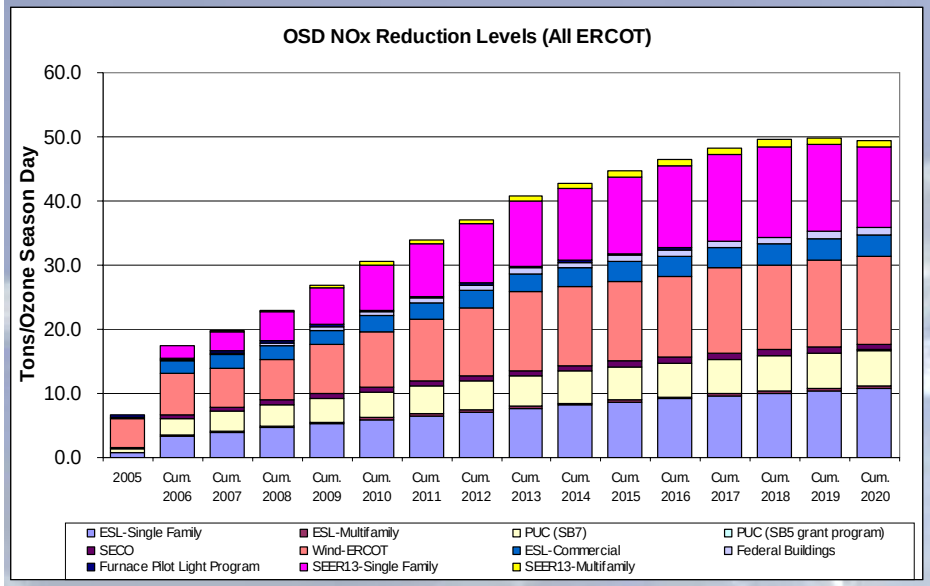
State Agencies included:

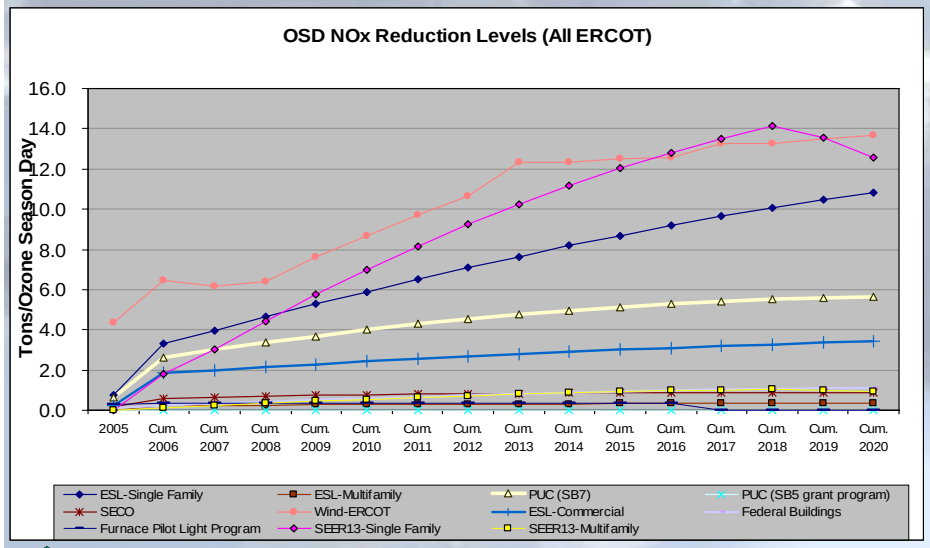
- *TEES/ESL,*
- *PUC,*
- *SECO,*
- *ERCOT/Wind*

Savings Integration allows:

- *Annual, OSD savings*
- *By County*
- *By SIP*
- *By Program*
- *Integration tool = Adjustable Discount, Degration, T&D losses*

Integrated NOx Savings: Results





Cumulative NOx emissions reductions calculated across state programs (2013)

Code Compliance (10.75 tons/day)

Federal Buildings (0.81 tons/day)

Furnace Pilot Lights (0.32 tons/day)

PUCs SB7,SB5 programs (4.78 tons/day)

SECO Political Sub. (0.84 tons/day)

Green Power (Wind) (12.32 tons/day)

SEER 13 Retrofits (11.03 tons/day)

Total (40.86 tons/day)

Annual Reporting to the TCEQ, papers, QAPP, etc.